SUMMARY

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for
RHIC Spin Collaboration Meeting VIII
RIKEN BNL Research Center

Since its inception, the RHIC Spin Collaboration (RSC) has held semi-regular meetings each year to discuss the physics possibilities and the operational details of the program. Having collected our first data sample of polarized proton-proton collisions in Run02 of RHIC, we are now in the process of examining the performance of both the accelerator and the experiments. From this evaluation, we not only aim to formulate a consensus plan for polarized proton-proton during Run03 of RHIC but also to look more forward into the future to ensure the success of the spin program.

In the second meeting of this series (which took place at BNL on April 12, 2002), we focused on Run02 polarization issues. This meeting opened with a presentation by Thomas Roser about his reflections on the outcome from the RHIC retreat during which the Run02 performance was evaluated. Of particular importance, Thomas pointed out that, with the expected beam time and his estimates for machine-tuning requirements, the experiments should limit their beam requests to two or three programs.

Following this presentation, we had a series of presentations which addressed the polarization performance as the beam traversed through the accelerator complex. Starting with the OPPIS source, Anatoli Zelenski reported that the source consistently produced pulses of 1×10^{12} protons with 70% polarization during the run. This polarization was, however, lower than had been expected following the August, 2001 studies which had indicated that 80% polarization was achievable. It was realized that this deficit might arise from unpolarized molecular hydrogen contaminating the polarized atomic hydrogen beam. Over the last three months, he has modified the source to filter out the molecular hydrogen. The resulting source now delivers 80% polarization. He feels that, with further work, it will be possible to increase the source to 85%, but did not speculate about the time scale for realizing such an improvement.[1]

From the source, the polarized protons are delivered to the AGS Booster ring where they are accelerated from 200 MeV to 1.5 GeV. Leif Ahrens reported on the polarization performance of the booster. He told us that there were few resonances which are crossed in the booster during ramping and that it is well known how to cross these resonance without losing polarization. So, there should be no polarization losses in the booster. Since the booster does not have a polarimeter, the polarization losses in it are evaluated by measuring the polarization in the AGS just after the beam is injected into it and comparing this measurement with the polarization in the source or the polarimeter at the end of the 200 MeV LINAC. As expected, these measurements showed that there was no loss of polarization in the booster.

Out of the booster, the beam enters the AGS where it is accelerated to the RHIC injection energy of 24 GeV ($G\gamma = 46.5$). Mei Bai reported on the polarization performance in the AGS. During ramping, the polarization dropped from an injection value of around 70% down to 20 to 30%. Losses were higher than expected because of the slow ramping rate of the AGS. However, measurements at different points in the ramp call into question the understanding of the spin model for the AGS because the losses at some resonances, in particular the 24-ν_y weak resonance, were higher than would have been expected based on the model. Work is still underway to understand how the weak resonance could have such a large effect.[2]

Out of the AGS, the beam is injected into RHIC. Osamu Jinnouchi presented the latest

[1] For an update on this issue, see Anatoli's presentation at the September meeting.

[2] For an update on this work, please see Haixin Huang's talk at the May meeting.

status of the offline analysis of the data from the RHIC polarimeter. During the run, the polarimeter operated quite well. At this stage in the offline analysis, he has been aiming to understand its performance. This work included applying an energy correction to account for the approximately 20% drop in the gain of the silicon detectors during the course of the run. The cause for this gain loss is presently under study. Even with this correction, the non-zero y-component observed in the yellow ring near the end of the run remains and thus is still unexplained. He also took a first and very preliminary look at the time dependence of the polarization within a fill. He sees that the polarization is maintained or decreases by, at most, 15% of the measured value at the beginning of the fill. He intends to continue these studies when he has further improved his understanding of the polarimeter.

And, finally, Vadim Ptitsyn presented the current understanding of the polarization performance within RHIC. The two Siberian snakes operated well during the run and, with them, it is expected that the spin tune will be held at 1/2 during the entire ramp. In this way, the standard resonances do not affect the polarization. However, the snakes introduce new resonances which need to be avoided by controlling the betatron tune during the ramp. In Run02, the polarization retention on the ramp was good in yellow for the most part but, in blue, was not as good. The cause of this difference is still under study.

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